

In the Claims

1 1. (currently amended) A compact electromagnetically electrically and optically
2 pumped multiwavelength photonic device nanocavity array comprising a plurality of
3 nanocavities, each nanocavity defined in a photonic crystal in which each nanocavity
4 is lithographically formed to define a corresponding predetermined spectral response
5 of each nanocavity, said plurality of nanocavities forming a patterned said array of
6 nanocavities.

1 2. (currently amended) The photonic device array of claim 1 where said spectral
2 response of each nanocavity which is lithographically formed defines is defined by
3 the wavelength of the electromagnetic wave which is supported in the photonic
4 crystal by said lithographically defined nanocavity.

1 3. (currently amended) The photonic device array of claim 1 where said spectral
2 response of each nanocavity which is lithographically formed defines is defined by
3 the polarization of the electromagnetic wave which is supported by said
4 lithographically defined nanocavity.

1 4. (currently amended) The photonic device array of claim 1 where said spectral
2 response of each nanocavity which is lithographically formed defines is defined by
3 the polarization and wavelength of the electromagnetic wave which is supported by
4 said lithographically defined nanocavity.

1 5. (currently amended) The photonic device array of claim 1 where the photonic
2 device comprises a laser and wherein said array of nanocavities is employed in the
3 a-laser array.

1 6. (currently amended) The photonic device array of claim 1 where the photonic
2 device comprises a detector and wherein said array of nanocavities is employed in
3 the a-detector array.

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1 7. (currently amended) The photonic device array of claim 1 where the photonic
2 device comprises an optical gate and wherein said array of nanocavities is employed
3 in the an-all optical gate.

1 8. (currently amended) The photonic device array of claim 1 where the photonic
2 device comprises an all optical router and wherein said array of nanocavities is
3 employed in the an-all optical router.

1 9. (currently amended) The photonic device array of claim 1 where the photonic
2 device comprises a modulator and wherein said array of nanocavities is employed in
3 the a-modulator.

1 10. (currently amended) The photonic device array of claim 1 wherein an
2 active quantum well is included in the photonic device and wherein said photonic

3 crystal in which the array of nanocavities are defined is formed in the active quantum
4 well material.

1 11. (currently amended) The photonic device array of claim 1 where the
2 photonic device comprises a vertical cavity surface emitting laser and wherein said
3 array of nanocavities is are employed in the vertical cavity surface emitting lasers,
4 VCSELs.


1 12. (currently amended) The photonic device array of claim 11 wherein said
2 nanocavities each have a volume size and wherein said volume size of each of said
3 nanocavities is approximately a cubic half-wavelength ($\lambda^3/2$).

1 13. (currently amended) The photonic device array of claim 1 comprises said array
2 is-an array of lasers each including an array of nanocavities and where at least one
3 nanocavity laser is used as a pump for an adjacent nanocavity laser.

1 14. (currently amended) The photonic device array of claim 1 further comprising a
2 nonlinear optical material filling said holes in the photonic crystal in which the array
3 of nanocavities are defined.

1 15. (currently amended) The photonic device array of claim 14 wherein said
2 photonic device with the array of nanocavities defined in the filled photonic crystal
3 comprises is a tunable nanocavity laser, detector, router, gate or spectrometer array.

1 16. (currently amended) The photonic device array of claim 14 further comprising
2 means for changing optical or electrical properties of said nonlinear optical material
3 in each of said nanocavities.

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1 17. (currently amended) The photonic device array of claim 1 where said photonic
2 crystals in which said array is are defined comprises a in-Si-Ge materials on a silicon
3 substrates disposed on an insulators.

1 18. (currently amended) The photonic device array of claim 17 further
2 comprising a silicon slab waveguide or integrated circuit integrated with said array of
3 nanocavities.

1 19. (currently amended) The photonic device array of claim 17 further
2 comprising a nonlinear optical material filling said photonic crystal and means for
3 changing optical or electrical properties of said nonlinear optical material
4 surrounding in each of said nanocavities.

1 20. (currently amended) The photonic device array of claim 1 further
2 comprising a waveguiding layer disposed adjacent to said array of nanocavities, said
3 waveguiding layer being transparent to light from said array and ~~is~~ critically coupled
4 to said nanocavities in said array.
